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EXAMINER	
PEACE, RHONDA S	

ART UNIT	PAPER NUMBER
2874	

DATE MAILED: 11/24/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/538,972	LEVOLA, TAPANI	
	Examiner	Art Unit	
	Rhonda S. Peace	2874	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *11 September 2006*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-15* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-15* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *11 September 2006* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Drawings

The drawings were received on 9/11/2006. These drawings are acceptable.

Claim Rejections - 35 USC § 112

The following is a quotation of the first paragraph of 35 U.S.C. 112:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

Claims 12-15 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention.

Independent claims 12 and 15 describe an apparatus having imager, or imager means, where the imager or imager means have a first and second image point, or in other words, a first and second emission point. However, in the Applicant's specification, no such embodiment exists where an imager has two emission points. Figures 8-10, as well as paragraphs 2-3 of page 10 describe a similar embodiment to that of claims 12 and 15. However, in the above portions of the Applicant's specification, the imager has only one image, or emission, point, where this image point is located either in the center of the imager, or is located at one end thereof. However, upon careful review of the Applicant's specification, the Examiner can find no suggestion to include two image points on an imager.

Claim Rejections - 35 USC § 102

The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

Claims 1, 3, and 6 are rejected under 35 U.S.C. 102(b) as being anticipated by Yoshida et al (US 5101297).

Addressing claims 1, 3, and 6, Yoshida et al discloses a diffractive grating element **15** arranged on a substrate **11** with waveguiding layer **12**, and arranged to interact with an incoming light wave from source **40** so that the incident light is coupled into the substrate **11** and is diffracted into a first order wave **21**, which propagates within waveguiding layer **12**, and a second order wave **22**, which propagates within the substrate **11**. The diffraction grating element **15** can be divided into two diffraction grating regions about their axis of symmetry, so that each region has differing diffractive properties due to the grating's **15** curved shape, as seen in Figure 1. As the axis of symmetry, seen along the direction of waveguide layer **12** in Figure 1A, is considered to be a transition point, the regions are substantially mirror images of one another with respect to the transition point. As can be seen in Figures 1A and 1B, the incident light from source **40** first interacts with the grating **15** along the transition point. The diffraction regions mutually compensate for a variation of input angle (see Fig 1) of the incident light wave, so that both first **21** and second **22** order diffracted waves are propagated within the substrate **11** and substrate waveguiding layer **12**. Each of the first **21** and second **22** order waves will inherently have their own diffraction efficiency

(column 3 lines 44-61, hereafter indicated as 3:44-61, 4:11-18 and 37-65, Figs 1A and 1B).

Claim Rejections - 35 USC § 103

The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

Claims 2 and 4 are rejected under 35 U.S.C. 103(a) as being unpatentable over Yoshida et al (US 5101297) in further view of Sakai et al (US 5279924).

Pertaining to claim 2, Yoshida et al discloses the grating device as discussed above. However, Yoshida et al does not disclose the grating **15** to be of an asymmetric period profile or a blazed grating. Sakai et al also discloses an optical diffraction grating element that allows incident light to be diffracted into first and second orders that propagate with equal intensities within the substrate supporting the grating (10:1-19, Figure 6C). In addition, Sakai et al also discloses the grating is of an asymmetrical periodic profile, and is preferably a blazed period profile (7:24-27, Fig 1F). It would have been obvious to one of ordinary skill in the art to combine the teachings of a asymmetrical, preferably blazed, periodic profile grating (from Sakai et al) with the teachings of Yoshida et al, because these gratings types improve the optical efficiency of any device having the grating, such as an optical head device (Sakai et al, 7:37-53).

Regarding claim 4, Yoshida et al discloses the grating device as discussed above. However, Yoshida et al does not disclose the two different grating regions having two substantially differing depths. Sakai et al discloses a grating which is arranged to have two sub-regions **4a** and **4b**, where each sub-region has a substantially

different depth, t_1 and t_2, respectively (2:65-68, 3:1-17, Fig 10B). One of ordinary skill in the art would have found it obvious to combine the teachings of Sakai et al (a grating with two sub-regions where each sub-region has a substantially different depth) with the teachings of Yoshida et al, as a grating with differing depths is well known in the art, and a grating with differing depths causes the diffraction efficiency of the first region to be unequal to the diffraction efficiency of the second region, thereby allowing for a grating which can be highly tailored to several desired diffraction efficiencies at various portions along the grating (Sakai et al, 3:13-25).

Claims 5, 7, and 8 are rejected under 35 U.S.C. 103(a) as being unpatentable over Yoshida et al (US 5101297) in further view of Schultz et al (US 6285813).

With regards to claim 5, Yoshida et al discloses the grating device as discussed above. However, Yoshida et al does not disclose the diffraction efficiency of at least one of the grating regions is arranged to vary at differing local distances from the transition point. Schultz et al discloses a diffraction grating coupler that couples incident light into a substrate. Splitting the grating of Figure 4 into two equal grating regions where the split occurs at the transition point, clearly Schultz et al also shows the diffraction efficiency of both grating regions are arranged to vary at differing local distances from the transition point (5:37-41 and 60-64, Fig 4). It would have been obvious to one of ordinary skill in the art to combine the teachings of Schultz et al (a grating in which the sub-regions have varying diffraction efficiency along the length of each sub-grating with respect to the transition point) with the teachings of Yoshida et al, as this grating structure is easily adaptable to gain the desired diffraction results, such

as diffraction of incident light at a predetermined angle; also this grating structure allows for customization so that the desired light intensity profile along the grating is achieved (Schultz et al, 5:41-64)

Addressing claim 7, Yoshida et al discloses the grating device as discussed above. However, Yoshida et al does not disclose grating regions such that the incident light wave has its first interaction with the grating within a single grating region. Schultz et al discloses a diffraction grating coupler that couples incident light into a substrate, where the grating is fashioned to allow any desired diffraction properties to be realized, as the diffraction efficiency of the grating is dependent upon the slant angle of the grating (5:37-45, Fig 4). In addition, Schultz et al also teaches that light may be incident upon the side of the substrate holding the grating, as well as the top portion of the grating (5:52-59). It would have been obvious to one of ordinary skill in the art to combine the teachings of Schultz et al (that light may be shown on the grating in several locations in order to get the desired diffraction efficiency and intensity) with the teachings of Yoshida et al, as this allows the grating to be manufactured in an extremely specialized way, such that a wide variety of coupling characteristics can be achieved with the grating by simply varying where light is shown on the grating, as the grating's diffractive characteristics vary along the grating length (Schultz et al, 5:37-65, Fig 4).

With respect to claim 8, Yoshida et al and Schultz et al disclose the grating device as discussed above. Yoshida et al does not disclose having the gratings regions arranged such that at least one of the regions redirects light back in a reverse direction inside the substrate. Schultz et al discloses light may be input from above the grating

and be refracted in a reverse direction inside the substrate, with the proper fashioning of the fringes of the grating, as the fringes, having a slant angle, are proportional to the diffraction intensity and also the diffraction angle of the light wave as it travels through the substrate (Fig 4, 5:37-65). It would have been obvious to one of ordinary skill in the art to combine the teachings of Schultz et al (slant angle can be fashioned in a any manner to produce the desired diffraction effect, including the effect where light is recirculated or redirected in a reverse direction within the substrate), as this allows the grating to function in a wide variety of applications, as light may be emitted from either side of the substrate, instead of from just one end.

Claims 9-11 are rejected under 35 U.S.C. 102(b) as anticipated by or, in the alternative, under 35 U.S.C. 103(a) as obvious over Yoshida et al (US 5101297). See MPEP 2112 [R3], Section III.

Regarding claims 9-11, Yoshida et al discloses the grating device as discussed above, disclosing all of the structural limitations of the current invention's claim 1. However, Yoshida et al does not disclose the function of using the grating to enlarge an exit pupil of an optical system, monocular system, binocular system, or virtual display. However, as Yoshida et al discloses an optical grating coupler device, it would have been obvious to one of ordinary skill in the art to utilize such a device in any optical system which requires an optical coupler (a grating for coupling light into and out of a substrate), such as an optical system, monocular system, binocular system, or virtual display. Furthermore, it has been held that a recitation with respect to the manner in which a claimed apparatus is intended to be employed does not differentiate the

claimed apparatus from a prior art apparatus satisfying the claimed structural limitations (*Ex parte Masham*, 2 USPQ2d 1647 (1987)).

Response to Arguments

Applicant's arguments filed 9/11/2006 have been fully considered but they are not persuasive.

With regard to claim 1, Applicant argues Yoshida does not disclose variation in the input angle of an incident light wave at a given point of the grating. The Examiner disagrees.

As is seen in Figure 1B of Yoshida, the light source **40** is tilted, such that a light ray emitted therefrom has portions which strike the grating at various angles. These portions strike the grating at the transition point ("given point"), as seen in Figure 1A and defined in the sections above, and therefore, the transition point receives a light ray having portions that strike the grating at various input angles. Because of this, the Examiner is of the opinion that the above limitation is met by Yoshida.

Conclusion

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not

mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Rhonda S. Peace whose telephone number is (571) 272-8580. The examiner can normally be reached on M-F (8-5).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Rodney Bovernick can be reached on (571) 272- 2344. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Rhonda S. Peace
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Art Unit 2874

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